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ABSTRACT

This study examined the nature of teaching expertise at the postsecondary level. Using the prototype view of teaching expertise set forth by Sternberg and Horvath (1995), which focuses on domain knowledge, efficiency, and insight, the teaching portfolios of 16 award-winning teacher educators from one of the largest colleges of education in the United States were examined. Specifically, reflective narratives were examined for the extent and variety of ways the features of the prototype model were represented and to determine whether critical features of teaching expertise were not included in the model. It was found that the data present a general picture which is consistent with many of the features of the Sternberg and Horvath model and supports a prototype conceptualization of teaching expertise. Eight of the ten features of expertise in the model were confirmed by the teachers in a variety of ways. The study also found evidence that affective dispositions, not included in the model, are an important factor among teacher educators. (MDM)

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EXPERT TEACHING IN A COLLEGE OF EDUCATION:

AN INVESTIGATION OF STERNBERG AND HORVATH'S PROTOTYPE VIEW

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ABSTRACT

EXPERT TEACHING IN A COLLEGE OF EDUCATION: AN INVESTIGATION OF STERNBERG AND HORVATH'S PROTOTYPE VIEW

This study explores university teaching expertise using a prototype view presented by Sternberg and Horvath (1995). Data were collected from the teaching portfolios of sixteen award winning teacher educators from one of the largest colleges of education in the United States. Reflective narratives were examined for the extent and variety of ways the features of the prototype model were represented and to determine whether critical features of teaching expertise were not included in the model.

The data present a general picture which is consistent with many of the features of teaching expertise identified by Sternberg and Horvath and supports a prototype conceptualization of teaching expertise. Eight of the ten features of expertise in the model were confirmed by the teachers in a variety of ways. The study also found evidence that affective dispositions, not included in the model, are an important factor among teacher educators. Considerations for philosophical orientations and sociological conditions also need to be investigated in formulating a comprehensive model of teaching expertise.

Introduction

The quest to improve American public education at all levels of schooling is a continuing public concern. For over a decade, a school reform movement has been focused on restructuring elementary and secondary schools. Likewise, educators in college and universities have been working to increase the effectiveness of programs of higher education (Svinicki and Menges, 1996).

Whether at the elementary, secondary, or postsecondary level a critical factor in educational reform is teacher effectiveness. Unless teachers demonstrate excellence, then most other attempts to change schools will fail. The need to understand and foster excellence in teaching is one of the foremost challenges of school improvement. This study explores the nature of teaching expertise and seeks to confirm a prototype of expert teaching proposed by Sternberg and Horvath (1995).

The specific focus of this study is on the nature of teaching expertise at the postsecondary level. Using the prototype view of teaching expertise set forth by Sternberg and Horvath (1995), the authors studied the teaching portfolios of sixteen award winning teacher educators in one of the largest colleges of education in the United States. The three central questions guiding inquiry were: (1) To what extent are the features of the prototype model suggested by Sternberg and Horvath represented in the reflective narratives provided by the sixteen expert university teachers? (2) What are the variety of ways in which each feature of expertise is manifested in university teaching expertise? and (3) What critical features of teaching expertise among teacher educators are not included in the Sternberg and Horvath prototype model of expert teaching?

Findings from this investigation serve as an important preliminary step in understanding expert teaching. The data collected in this study can add support to certain categories and features of the prototype view of teaching expertise proposed by Sternberg and Horvath and permit modifications appropriate for expert teachers in the field of teacher education. Identifying a prototype can enhance efforts to recognize a range of individual capabilities that result in teaching excellence and in turn inform decisions about recognition and rewards for teaching. A model of teaching expertise also provides a basis for the selection of faculty, the development of training programs to improve teaching effectiveness, and self reflection and evaluation.

Theoretical Framework

This study is based upon the Sternberg and Horvath (1995) conceptualization of expert teaching. According to these researchers, it is more productive to identify experts on the basis of their similarity to one another than by a set of necessary and sufficient features. While Sternberg and Horvath believe that there exists no well defined standard that all experts meet and that no nonexperts meet, they do recognize that experts share family resemblances which can serve as the basis for differentiating them from nonexperts. This view allows variability in the profiles of experts yet provides a standard for differentiating experts from nonexperts.

The family resemblances that experts have in common enables us to form similarity-based categories. Sternberg and Horvath propose that collectively, these categories would serve as a prototype representing the central tendency of feature values across all valid members of the category. The prototype consist of typical exemplars of a category and serves as the standard for judging expertise. The higher the similarity between an object and the prototype, the higher the probability the object belongs to the category. However, with this theoretical orientation, different members of a category might resemble the category on different features and some members might only possess a few, but heavily weighted features, in order be included in category membership.

In presenting their prototype view of teaching expertise, the researchers used a featural model of similarity-based categorization. The elements of this model were derived from psychological research. The model consist of three clusters of features each of which includes cognitive abilities thought to be related to expert performance. Figure 1 outlines Sternberg and Horvath's model of expert teaching and specifies defining characteristics.

The three clusters of features in the model that make up the prototype expert teacher identify three fundamental ways that experts differ from novices. They were derived by Sternberg and Horvath from a review of psychological research on expert performance in a variety of domains. The three constellations of features are: (1) domain knowledge, (2) efficiency, and (3) insight.

Domain knowledge refers to knowledge in an area of expertise that the expert brings to bear upon a problem in a more effective manner than would either a novice or experienced nonexpert. In teaching expertise, Sternberg and Horvath identify three types of necessary knowledge: content knowledge, pedagogical knowledge, and practical knowledge. Pedagogical knowledge is further divided into content-specific and content-nonspecific knowledge. Likewise, practical knowledge is further divided into two types: explicit and tacit.

Efficiency pertains to the expert's ability to solve problems in the domain of expertise in less time and/or with less effort than is required by the novice. Experts use the cognitive mechanism of automatization to deal with reoccurring problems, and with the time saved they reinvest their cognitive resources to do more thoughtful planning, monitoring, and evaluating.

Insight, the third cluster of features in the prototype model of expert teaching, addresses the ability of the expert to arrive at more creative solutions that are both novel and appropriate. The expert sees more deeply into the problem and is able to reconceptualize the problem and find innovative ways of solving it. Included in this cluster of features are selective encoding, selective combination, and selective comparison. These three clusters of features represent what Sternberg and Horvath believe, on the basis of research findings concerning teaching expertise, to be the content upon which a prototype of the expert teacher should be established.

KNOWLEDGE	↔ EFFICIENCY	↔ INSIGHT
• what is known, how much is known, how it is understood and organized • analysis	• does more with less effort • speed and accuracy • application	• used for solving problems • applies knowledge & analyze problems to reach solutions • leads to new paradigms • creative solutions to problems • solutions are novel and appropriate • able to identify deeper issues • understands when deeper problems have been identified and reasonably solved and if it is time to move on to new issues • synthesis
Content • teacher-centered • subject matter • more knowledge & understanding • pedagogy as content • specific statements of key concepts • how knowledge is updated & refined **Pedagogical** • student-centered • how to teach, motivate, manage • not necessarily deep structure • strategies for facilitating mastery 1. Content - specific • how to teach specific concepts • how to present domain-specific concepts • questioning and feedback • strategy for facilitating mastery 2. Content - non-specific • routines and management • increases time for instruction **Practical** • environment-centered • knowledge of social & political context • how to get things done • how to get needed resources 1. Explicit • formally stated • rules, regulations, criteria, grant procedures, etc. 2. Tacit • not usually taught • how to shape environment • labeled as expert	**Automatization** • more cognitive processes are resource-independent rather than resource-consuming • mental resources can be used for new problems • experience is important **Reinvestment of Cognitive Resources** • uses time & effort saved through automatization to construct better problem models • work on leading edge • seeks more complicated problems rather than to simplify things **Executive Control** • disposition toward self-reflection • "continuous learning through experience" • mental processes that support reinvestment of cognitive resources 1. Planning • spends more time trying to understand problem 2. Monitoring • checks accuracy in solution attempts 3. Evaluating • checks alternative hypotheses	**Selective Encoding** • distinguishes relevant from irrelevant information **Selective Combination** • determines how separate information can/should be usefully put together **Selective Comparison** • notices similarities (analogies) to solve problems • maps analogies - uses analogies to teach • applies analogies - uses analogies to reach creative solutions to problems

Figure 1. Sternberg and Horvath Model of Expert Teaching

Data Sources and Analysis

The data for the research were obtained from the teaching portfolios of 16 recipients of the Teacher Incentive Program Awards. This statewide program provided financial awards to university professors who demonstrated superior teaching in the university. For the purposes of this research, these award recipients were regarded as "expert" teachers because they were identified by a committee of their peers as evidencing documented teaching excellence.

The Expert Teachers

Sternberg and Horvath differentiate between novice and expert teachers in their model of expert teaching. The teachers in our study ranged in university experience from 3 to 27 years. Three years of teaching at the university was the minimum requirement for applicants for the award. Most departments in the college, however, require candidates for faculty positions to have previous school-related teaching experiences in addition to university work. None of the award applicants, therefore, were considered novice teachers.

According to the requirements of the award set forth by the state legislature and by the university, the majority of the assigned time of the applicants was spent in teaching, as opposed to research, advising, or administrative duties. The expert teachers in this study represented five of the eight departments in a college of education. The total number of faculty in the college was 160. The award program was new, and so none of the expert teachers had been recipients of this award before. Table 1 reports demographic information on each of the sixteen teachers in the study.

Table 1

Demographics of the Expert Teachers

Teacher[a]	Field	Rank as Professor	Yrs. since Degree	Yrs. at Institution
1	Math Education	Assistant	4	4
2	Physical Education	Associate	25	24
3	Special Education	Associate	8	8
4	Physical Education	Full	26	25
5	Elementary Education	Assistant	9	4
6	Technology Education	Assistant	4	4
7	Foreign Language Education	Associate	6	6
8	Reading Education	Full	17	17
9	English Education	Associate	7	7
10	Physical Education	Full	27	27
11	Physical Education	Associate	11	4
12	Reading Education	Full	14	22
13	Math Education	Assistant	3	5
14	Business Education	Assistant	14	8
15	English Education	Assistant	12	4
16	Social Studies Education	Assistant	5	4

[a]The number of the teacher identifies quotations in the text.

The Teaching Portfolios

Each teaching portfolio for the Teaching Incentive Program contained (a) a reflective narrative describing the teacher's philosophy, goals, and conduct of university teaching, (b) copies of syllabi for all courses taught, (c) samples of course materials and student products, (d) copies of students' course evaluations, (e) reports from the university's annual review process, and (f) letters of support from colleagues and supervisors. Of these materials, only the reflective narratives were used for this research. The other elements of the portfolios were eliminated as data sources because the content of the course syllabi are largely determined by college policy rather than professors' judgments and the valid analysis of the content-specific course materials would require substantial content expertise in each professor's area of specialization. Further, students' ratings of teachers, annual reviews, and letters of support were consistently positive for the award winners and these data sources lacked the detail and specificity that were needed to elucidate the manifested elements of the prototype of teaching expertise.

Analysis of the Narratives

The research process began with a content analysis of the reflective narratives, using the prototype model proposed by Sternberg and Horvath as a framework. An iterative process was followed in which we (a) developed working operationalizations of the Sternberg and Horvath features as manifested in the documented activities or distinctions provided in the narratives, and (b) verified our operationalizations by grounding them in the text of the narratives. In each cycle of this process, the three researchers independently reviewed two or three narratives, making marginal notes, classifying elements of the text into the features suggested by Sternberg and Horvath, and identifying documented elements that did not fit well with the prototype features. The researchers then met as a group to resolve discrepancies about our analyses of the narratives and to further clarify the model as it applies to expertise in university teaching.

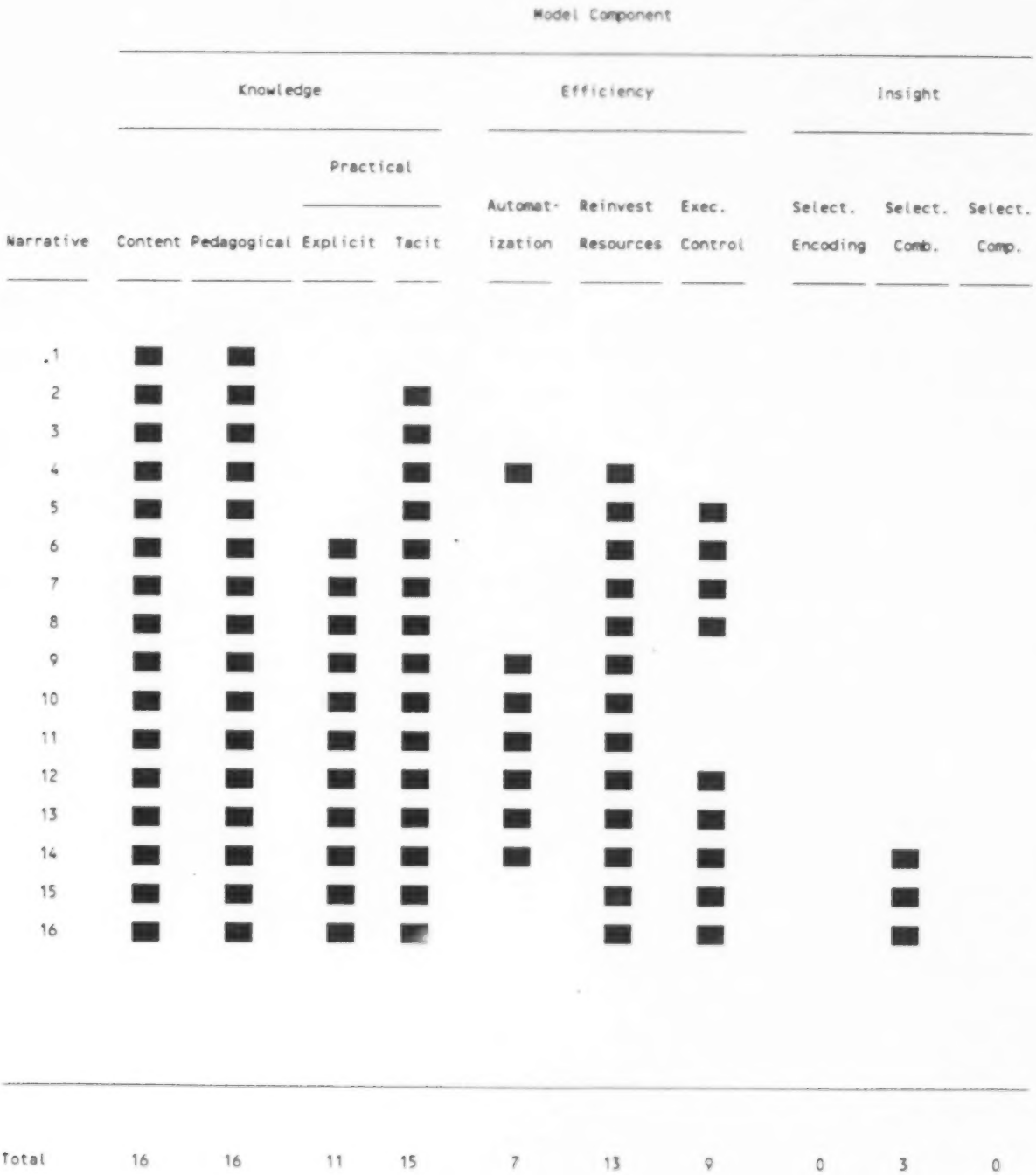
Our independent interpretations and group analyses were directed at three objectives: (a) to determine the extent to which the features of the prototype model suggested by Sternberg and Horvath are represented in the narratives provided by the 16 expert university teachers, (b) to describe the variety of ways in which each feature is manifested in university teaching expertise, and (c) to identify critical features of teaching expertise that are not included in the Sternberg and Horvath prototype model.

Discussion of the Prototype Features

As an overview of the extent to which the narratives provided evidence consistent with the Sternberg and Horvath model, Figure 2 presents a depiction of categories represented in each teacher's narrative. The indicator matrix does not present the depth of evidence in each category, only the presence of at least one verbal description consistent with each component of the model. As is evident in this figure, Knowledge was most heavily represented in the narratives. All of the narratives contained evidence of both content knowledge and pedagogical knowledge. The area of explicit practical knowledge was represented in eleven narratives, and that of tacit practical knowledge was represented in fifteen.

Figure 2

Evidence of Elements of Sternberg and Horvath Model in Sixteen Narratives.



Sternberg and Horvath's Efficiency component was less well represented in the narratives. Specifically, thirteen of the sixteen narratives provided some evidence of reinvestment of cognitive resources, and nine of the narratives provided evidence of executive control. Only seven narratives provided explicit evidence of automatization, although we interpreted reinvestment of cognitive resources as requiring automaticity.

Least well represented in the narratives was the category of Insight. Only three of the sixteen narratives provided evidence of this aspect of expertise, with all three narratives containing evidence only of selective combination. None of the narratives contained evidence of either selective encoding or selective comparison.

A description of the breadth of activities that were documented in each category is detailed below, as well as a description of the major themes represented in these activities.

Knowledge

The first constellation of features of expertise addresses the nature of knowledge that the expert possesses and how the knowledge is related to exceptional performance. Sternberg and Horvath recognize that there are at least three types of knowledge necessary for expert teaching. Building on the work of Lee Shulman (Shulman, 1987) they distinguish content knowledge and pedagogical knowledge. In addition, they include knowledge of the social and political context in which teaching occurs (practical knowledge) as a third type of knowledge necessary for expert functioning. Not only do experts have more of each of these three types of knowledge, but they have a deeper understanding and organization of the knowledge than do novices or experienced nonexperts.

Content knowledge. Sternberg and Horvath explain that expert teachers differ from novices in the amount of knowledge stored in memory that allows the encoding of new information in meaningful ways. Because none of the award applicants, either successful or unsuccessful, were novice teachers, we looked for other evidence of content knowledge in their narratives that were aligned with the model. First we considered the difficulty in evaluating statements of deep structures of content knowledge. The expert teachers represented nine content specializations. We, the researchers, were from three separate departments within the college, but did not have expertise ourselves to evaluate the validity of statements of deep structures or core principles within each content specialization. Nevertheless, in examining the narratives of the expert teachers in this study, we were able to identify several characteristics of the content knowledge component.

In the narratives, the expert teachers gave specific evidence that they valued mastery of content knowledge in their respective fields and also that they used this knowledge. For example, a special education faculty member wrote, "Issues such as inclusion, community integration and quality of life for individuals with disabilities are germane to the field of education. Though often controversial, these and other topics are the basis for discussion and debate in the classes I teach." (Teacher 3) Another educator similarly identified content in her courses, "Both courses strive to examine the current trends of global perspectives in education and afford students the opportunity to explore the important issues of

diversity in our society." (Teacher 16) Other teachers made statements of what they considered core principles of their content specializations. One faculty member wrote, "The goal of English instruction is to improve students' performance in language. It is not one of 87 goals; it is the only goal." He later wrote more globally, "I want to continue creating new graduate courses for experienced teachers that will focus on changing, not only the teachers' instructional style, but also their belief system about such fundamental questions as (1) what's worth knowing? and (2) how do students learn?" (Teacher 15) A foreign language educator wrote about a fundamental core of her field, "There is an urgent need for moving away from monolingualism in the nation and for developing foreign language proficiency. . By providing them [students] with opportunities to learn about other cultures and people, first hand through language, we will have moved one-step closer to having open-minded, culturally sensitive leaders who can communicate with other people." (Teacher 7)

A second area that we examined was pedagogy as content knowledge. In addition to the knowledge base for a specific area, such as math, reading, or physical education, we defined content knowledge for teacher educators as the knowledge of instructional strategies that are appropriate for that subject area, such as reading or math strategies. This content knowledge included pedagogical knowledge if it was the understanding of those instructional strategies that our students would in turn use with their future students. We differentiated between teaching preservice teachers how to teach and the pedagogical knowledge that the expert instructors used to facilitate learning in the college classroom.

Many of the expert teachers recognized that knowledge of pedagogy is a component of their content knowledge. This knowledge of pedagogy was stated in a variety of ways, but each was quite explicit. One statement was, "You can recognize an interactive classroom by the presence and operation of two characteristic features: (1) the students talk more than the teacher does, and (2) the teacher is not asking questions for which he or she already knows the answers." (Teacher 15) A math educator wrote, "In all of the classes I attempt to model the Professional Teaching Standards as published by the National Council of Teachers of Mathematics." (Teacher 1)

Other faculty recognized problems their students would encounter as teachers and focused on appropriate strategies. A physical education teacher identified a problem in that field, "A fairly large percentage of middle and senior high school students lack skill, fitness and knowledge about physical activity. Consequently, many of these students exhibit 'learned helplessness,' behavioral traits and negative attitudes about being involved in physical activity." He then summarized the instructional focus that he advocates, "My primary professional responsibility as a teacher educator is to prepare physical educators who are committed to teaching secondary students in a student-centered process in which they develop a positive attitude towards physical activity and strive to develop and maintain healthy lifestyles." (Teacher 10)

A third aspect of content knowledge identified included descriptions of the ways in which the faculty keep their knowledge base current in both the content of their teaching specializations and in instructional strategies appropriate to their field. Faculty described reading journals and other professional

literature and attendance at conferences on a regular basis. Several wrote about the need for practical experiences to keep their knowledge current and to make real-life connections for their students.

Pedagogical Knowledge. In addition to content knowledge, the authors found evidence that the expert teacher educators possess extensive knowledge of how to teach. Sternberg and Horvath identified this feature as pedagogical knowledge, a feature which includes knowledge of techniques to motivate students, classroom management skills, and how to design appropriate assessments for students. Although the Sternberg and Horvath model differentiates between general pedagogical knowledge and pedagogical content-specific knowledge, such distinctions were not clear in the narratives. For this reason, these two classes of pedagogical knowledge were combined for this study.

A manifestation of teachers' pedagogical knowledge that was evident in the narratives was knowledge of the characteristics of learners. This category represents the teacher's awareness and consideration of the learner and differences between learners in the conduct of instruction. Often, these statements represented the teachers' explicit consideration of learners' characteristics when they enter the university classroom. For example, one faculty member noted that "My students invariably agree that they hated social studies as school children and that, to varying extents, they still feel some trepidation." (Teacher 16)

A second area of pedagogical knowledge that was evident in the narratives was explicit concern with the goals of instruction. The faculty members' narratives often contained statements that indicated the teachers' explication of instructional goals. Most often, such goals included affective or motivational components. For example, a mathematics educator stated, "The challenge is to get these students confident enough that they teach their own classes following the example that my colleagues and I have set before them, and at the same time expand their own, often limited, mathematics background." (Teacher 1)

Many of the narratives included a general discussion of methods used in instruction. For example, a physical educator mentioned the variety of effective teaching methods that she modeled in her teaching: "effective management of class time; providing appropriate levels of student feedback along with frequent quizzes and written assignments; in-class questioning to stimulate students' critical thinking skills and participation." (Teacher 11)

These discussions of methods used in the college classroom demonstrate a general awareness of the importance of choices in teaching methods. A subset of the narratives, however, provided an explicit linkage between the methods used and the goals sought. These types of statements, demonstrating awareness of the connection between goals and methods, appear to be more clearly characteristic of the pedagogical knowledge component of teacher expertise than are statements that independently enumerate goals and methods. For example, an elementary educator described the methods she used to help students at remote sites in distance learning classes to maintain a sense of involvement in the class: "one way to do this is for each site student to provide the studio with a photograph. When the student calls in to participate in class discussion, that photo is displayed on the

television monitors.." (Teacher 5)

Practical Knowledge. A third type of knowledge which Sternberg and Horvath believe characterizes teaching expertise is knowledge of the social and political context in which teaching occurs. From an analysis of the narratives used in this study, there is ample evidence to support this feature as a viable component for a prototype of an expert teacher.

Practical ability is described by Sternberg and Horvath as being "savvy" and knowing how to work the system to obtain needed resources for teaching. Such knowledge enables the expert teacher to attain valued goals and succeed. Two types of practical knowledge differentiated by Sternberg and Horvath are explicit and tacit. Explicit practical knowledge includes knowledge of formally stated rules and procedures for functioning the environment. While some practical knowledge is explicit, a great deal of it is not transmitted formally in an environment and often is not even verbalized. In other words, much of practical knowledge is what Polanyi (1967) refers to as tacit knowledge.

To be successful in applying explicit practical knowledge, one usually needs a tacit understanding of the political and social context. For example, success in having a course or program approved is greatly enhanced if the faculty member not only knows the formal procedures for the approval process but also knows ways to influence committee members and ways to find out information regarding likely problems with the proposal. Explicit knowledge seldom works in isolation from tacit knowledge. Consequently, our evidence for practical knowledge most often reflects a combination of these two dimensions of practical knowledge.

Evidence of practical knowledge was manifested in a variety of ways by the experts in this study. One way practical knowledge was demonstrated by these teachers was their success in securing resources needed to be effective teachers and to support their development as experts. A mathematics educator stated, "I regularly use the loaner program from Texas Instruments to borrow classroom sets of fraction calculators and graphics calculators." (Teacher 13) In one narrative, a teacher in the area of instructional technology described how she secured needed hardware and software for instructional purposes from vendors. Award winners in the areas of foreign language, instructional technology, physical education, and mathematics education secured grant funds to acquire special classroom materiais. Such activities illustrate practical knowledge applied to "working the system" in order to achieve goals.

Another way practical knowledge was manifested among the experts was success at securing approval, support, and permission for their individual program objectives both within the institution and in the community at large. These experts teachers demonstrated their knowledge of the ins and outs of getting their ideas through the political structure and bureaucracy by the fact that proposals were accepted and implemented. Most of the participants reported approval and implementation of changes they had initiated in courses and programs.

A frequently mentioned way of using practical knowledge to shape the learning environment was to work with people both within the college and university and outside the university. Thirteen of the

faculty members in the study described success in establishing collaborative arrangements with either colleagues, local school districts, corporations or a combination of these partners. Such associations involved knowledge and skill in packaging and selling ideas. In addition, these arrangements often required the teachers to manipulate their university teaching schedules so that they were able to fulfill the commitments to such arrangements. For example, one mathematics educator arranged to teach mathematics one period a day to a group of seventh graders as well as meet her responsibilities at the university. These liaisons enabled the faculty members to have access to additional instructional resources.

Success at being labeled an expert was still another way practical knowledge was manifested among the participants in this study. Being labeled as an expert provides a teacher with the opportunities for further career development and makes support for effective teaching easier to obtain. In this study, the teachers made concerted efforts to establish their credibility and expertise through a variety of activities. They were highly skillful in getting articles and books accepted for publication. They knew how to get proposals for presentations at conferences accepted. They developed extensive records of inservice work in surrounding counties. They also knew how to be selected for positions in professional organizations and to achieve recognition as outstanding teachers by being the recipient of teaching awards. One reading educator was featured in the local newspaper for her work in a professional development school in the community. Three award winners mentioned their students' special accomplishments, recognitions, and awards. All of these activities contributed to the reputation of "expert" for the teachers being studied and afforded them additional opportunities to develop their expertise.

Various comments in the narratives revealed participants' awareness of the importance of knowledge concerning the political and social context in which teaching occurs. One reading educator, stated that she worked on site in public schools in order that she could better learn "...the school culture..." and so that "...the teachers learned to accept me as more of an equal." (Teacher 8)

The expert teachers in this study not only recognized the importance of practical knowledge for themselves, they also exhibited a concern that their students acquire such knowledge. A reading educator, expressed the belief that her responsibilities were "...to develop organizational knowledge of schools and school districts." (Teacher 8) A physical educator reported, "In addition to preparing and teaching Physical Education classes, students are asked to immerse themselves in the life of the school. They spend time in classrooms, administrative areas and interact with students in the cafeteria. They are evaluated and receive feedback for their ability to interact with all of the cultures of the school to the same degree as they do for their ability to prepare and present appropriate learning experiences in physical Education." (Teacher 2) Three award winners stressed the importance of encouraging students to become involved in professional organizations and student organizations.

While practical knowledge is not a sufficient feature for teaching expertise, it is a feature Sternberg and Horvath acknowledge as important and often ignored in the study of expertise. From this study, there is evidence that practical knowledge is one component in a prototype of expert teaching.

Efficiency

Another cluster of features that contributes to the prototype of an expert teacher is efficiency. Experts can do more and do it better in a shorter time and with less effort than novices. Simply put, within their domain of teaching, experts are more efficient at solving problems than novices or nonexpert experienced teachers.

An explanation set forth by Sternberg and Horvath for superior problem-solving ability of expert teachers is that they use their experience to routinize many cognitive demands and then reinvest their cognitive energy to arrive at better solutions. Experts delve more deeply into problems and seek more complicated problems rather than trying to simplify things. Time saved from automatic responses is used to construct better problems models and work on leading edge questions and solutions.

Automatization. Direct evidence of automatization in the experts' narratives reviewed in this study was not abundant. However, there were numerous instances of indirect evidence that such a cognitive ability existed among the experts studied. Automatization appears to be a prerequisite skill that enables the expert to have the time and cognitive energy to exercise executive control. Sternberg and Horvath acknowledge that automatization converts resource-consuming cognitive processes into relatively resource-independent or automatic processes. The expert then engages in higher order executive processes called "metacomponents" that are used to plan, monitor, and evaluate ongoing efforts at problem solving. Since we found many cases of experts working on the leading edge and constructing better problem models as well as executive control functions, we inferred automatization ability.

There were some statements in the narratives that we classified as directly relating to automatization. Several faculty members mentioned activities and projects that were very time intensive but they were able to conduct them in spite of the time required. For example, a physical education educator reported that in addition to other responsibilities, "...I have taught six different courses annually and supervised interns across two levels....I have produced numerous articles and abstracts as well as two book chapters....[I have made] presentations at the international, national, regional, and state levels. Currently, I continue to serve as a major investigator...[of] a $2.2 million NIH grant...." (Teacher 4)

Reinvestment of Cognitive Resources. Automatization frees cognitive resources that would otherwise be consumed by the processes that have not been routinized. Sternberg and Horvath suggest that expert teachers make wise use of these freed resources by reinvesting them. Specifically, experts invest resources in developing more complicated problems, constructing better models for problem solving, and working on "leading edge" issues. Such reinvestment was frequently evident in the narratives reviewed.

On area of reinvestment of resources was the creation of courses or programs at the university. This category represents the teacher's efforts to improve the formal coursework that is a part of the professor's duties. It sometimes involves creation of new courses or the substantial revision of existing courses. On a larger scale, this type of reinvestment involves designing or revising entire programs. For example, a technology educator documented her investment of resources in the development of graduate

programs in her area, including the redesign of the Master's program and the development of a Ph.D. program track.

A second category of reinvestment of cognitive resources is the incorporation of new issues or methods in the conduct of existing courses or program experiences. Although this category does not represent the creation of new courses or programs, the investment of resources is used in attempts to improve the existing courses. For example, an English educator noted a number of innovations he has incorporated into his courses, including, "I have implemented another innovative feature for my methods courses. I relocated the setting so that students now meet on-site at [a local high school]. I made arrangements with both the principal and English Department chair so that I could meet weekly with my students at the school... My students were able to observe "real" classrooms easily and frequently, and my students were often invited by members of the English faculty to come into the classroom and conduct instructional activities that they (the methods students) designed themselves." (Teacher 15)

Outside of formal university courses and the development or refinement of degree programs, the participants' narratives often noted reinvestment that takes the form of leadership or participation in innovative projects. These projects represent new avenues of scholarly activity, representing in some cases, the experts' work on the "leading edge." Examples of such activities are a social studies professor's statement that, "I am co-chair of the college's Urban Education Initiative. This transdisciplinary task force seeks to find ways to prepare future and current teachers for service in economically disadvantaged urban schools." (Teacher 16)

A frequently cited reinvestment of resources was the preparation of publications or presentations to colleagues. This category represents the investment of resources in scholarly publications or papers presented to peers at professional conferences.

Executive Control. A third feature of efficiency represented in the experts' narratives we studied was executive control. According to Sternberg and Horvath, novice teachers may not have gained automaticity in various aspects of teaching compared to more experienced teachers. While both experienced experts and nonexperts have shifted from resource-consuming to resource-independent teaching functions, the experts and nonexperts differ in that the experts reinvest their cognitive resources by moving the time and effort saved into higher-order problem solving. A characteristic of their higher-order problem solving is their use of executive control by engaging in a planful process during which they reflect in order to understand the nature of their problems, construct more complex problem models, and continually monitor and evaluate their solution attempts.

The expert teachers in our study demonstrated a disposition toward reflection. Several engaged in a continuous cycle of planning and evaluation in which they tried out many strategies for teaching, assignments, and field experiences and evaluated their results. These teachers did not merely assigned grades and judge their teaching as successful by those grades.

Statements that we categorized as executive control were of three types. The first type described the identification of an instructional problem and stated a solution attempt. A math educator described a

problem she faces with her students, that is, the change in instructional strategies and conceptual development currently used as compared to those experienced by many of the students in their own schooling. She wrote, "The emphasis is no longer on heavy duty manipulative skill or blind acceptance of algorithms. Rather, there is much more emphasis on concept development and having students construct their own meaning of the content. Since most of the preservice teachers and many of the practicing teachers have not themselves experienced learning in this manner, the challenge is to engage university students in the types of activities that would be appropriate with their own students in the precollege classroom." She then described her solution attempts. In part she wrote, "I attempt to meet this challenge through the approach that I take in the classroom. I rarely have extensive lectures about methods. Instead, I model appropriate methods through the classroom environment. In my elementary methods courses, there is a very strong emphasis on the use of concrete materials. I have students work through activities appropriate for children in much the way that they might use the activity in an actual classroom." (Teacher 13)

A social studies faculty member stated, "Time and again research studies are published declaring that the social studies are the least liked subjects in the K-12 curriculum." She described how she surveyed her students' attitudes at the beginning of each semester and found that "My students invariably agree that they hated social studies as school children and, that to varying extents, they still feel the same." This expert teacher continued, "My goal for the next 16 weeks then becomes to systematically and permanently change theses students' perceptions about the content area." (Teacher 16) Her narrative then described a series of instructional strategies and activities that she used to achieve her goal and solve the serious problem that she had identified.

A second aspect of executive control demonstrated by the teachers was the reflection on their work that resulted in modifications of their teaching and course assignments. One teacher wrote, "Their October 18 assignment was to reflect on what they liked/disliked, benefitted from, could live without, were learning, and would change. The feedback was wonderful and, as it was midterm, provided me an opportunity to address their concerns and restructure some activities where needed." (Teacher 14) Another teacher included three syllabi from one course taught in three different semesters within the three year period of the award cycle. Each syllabus revealed changes, such as the amplification of the information provided to the students and the addition and elimination of assignments.

A third aspect of executive control was the ways in which the expert teachers sought feedback on their effectiveness as teachers and as problem solvers. Several described studies that they conducted and surveys of students' ideas and opinions. The validity of the studies was confirmed by professional reviews for publications and conference presentations. Other experts sought validation of their effectiveness by grounding their teaching in concurrent classroom experiences with children. One teacher explained, "Throughout the past 3 years, Centennial [School] teachers met with me regularly to provide input about interns and to advise me on what they wished our students knew at each stage of their teaching. With this information we hope to explore ways of improving our undergraduate program. The

experience at Centennial [School] has been most rewarding, exciting, enlightening, and unique. I am convinced that working this closely over three years with an involved and committed faculty has helped me evolve into a better undergraduate teacher." (Teacher 8)

Other strategies for gaining insights included having students and interns keep journals and learning logs, interviewing practicing teachers, and pilot testing activities and assignments. One teacher succinctly stated an attitude expressed by many of the expert teachers, "The important point is to be a continual learner." (Teacher 5)

Insight

A third constellation of teaching expertise described by Sternberg and Horvath is insight. This area represents the process of solving problems by applying knowledge and analysis. Experts and nonexperts both solve problems, but the solutions of the experts are more likely to redefine the problems in ways that lead to solutions that are leading edge. The narratives did refer frequently to leading edge solutions to problems, but the teachers, in general, did not write in detail about how they reached those solutions and the thought processes involved. Consequently only minimal evidence was found for features in this constellation.

Three teachers did, however, provide discussions that were identified as selective combination. For instance, one teacher described his goals for instruction. He described a process by which he identified instructional goals and synthesized a series of discussions, data gathering assignments, and writing to help students construct their own understanding of concepts and strategies in his discipline. He finished his description of the series of assignments, "Through such negotiation of meanings, students' individual conceptions of the 'learning' concept are changed and modified and improved. . They have an opportunity to view their conception of learning from a new angle and express their insights in a new way." (Teacher 15)

A second teacher explained how she worked with two colleagues in two separate disciplines to integrate course materials. The expert teacher described the integrated course. "In the elementary course, three different methods courses were combined: social studies, language arts and reading. Students were able to forge the relationships among the three content areas and produce teaching materials that incorporated all three. For example, I used multicultural children's literature to advance social studies themes while working with my colleagues on incorporating language arts and reading competencies. In addition, I employed current events lessons using newspapers wherein the application of vocabulary skills and journal writing played significant roles." (Teacher 16) The integration was an innovative arrangement of courses across disciplines and required the instructors to look at nontraditional ways of assigning courses.

Summary, Discussion, and Conclusions

Understanding excellence in teaching is a complex endeavor. Sternberg and Horvath have proposed a prototype conceptualization of expert teaching and have used psychological research findings to piece together a tentative view of teaching expertise. From studying the narratives of sixteen award

winning teachers, some progress has been made in confirming certain features of a prototype of an expert teacher.

Eight features of expertise proposed by Sternberg and Horvath were in fact substantiated in our study of expert teacher educators. Figure 2 presents a depiction of the categories represented in each teacher's narrative that are consistent with the Sternberg and Horvath model. A visual scanning of the matrix shows that experts in this study demonstrated the four types of knowledge Sternberg and Horvath included in their model. Also evident from the matrix is that all three features of efficiency and one feature of insight were represented to a lesser extent in the faculty narratives analyzed.

In terms of the knowledge category of expertise, the expert teacher educators repeatedly expressed a concern for content knowledge. They stated core principles in their areas of specialization and communicated an interest in the overriding goals and fundamental organization of the subject matter they were teaching. Comments in the narratives provided evidence that they valued mastery of content knowledge in their respective fields and also that they used this knowledge. They understood that their students not only needed mastery of subject matter, but also understanding of effective instructional strategies to use with their future students. Additionally, the expert teachers all spent extensive time and energy in keeping current in their individual fields through reading, attending conferences, and participating in workshops and other professional activities. In other words, the expert teachers were consistent in the ways they provided evidence of their content knowledge.

Expert teachers in this study also demonstrated knowledge of pedagogy, another major feature of the Sternberg and Horvath view of teaching expertise. The narratives supplied ample evidence that faculty were greatly concerned about methodology and were knowledgeable concerning a wide variety of instructional techniques and strategies. Typical of the strategies described were ones that are innovative and labeled as "best practices" methods. Knowledge of cooperative learning, portfolio assessment, multimedia materials, case studies, reflective activities, and multicultural projects are examples of such methods. In general, nearly all participants described student-centered practices in which learners were actively involved in class sessions.

An interesting relationship was discovered between content knowledge and pedagogy. The narratives revealed a compatibility between the experts' stated purposes and their methods. The experts appear to be clear about their direction and use methods that are congruent with and reinforce their ends. Quite often faculty reflected on the purposes for their professional behaviors and justified their methods in terms of these purposes. Perhaps the strongest indicator of this relationship was the frequently mentioned value of modeling for students practices that were consistent with course content and goals.

Sternberg and Horvath identified practical knowledge as yet another kind of knowledge which expert teachers possess. In the expert narratives we analyzed, we confirmed this quality. These experts were adept at finding and obtaining the resources needed for their teaching. They were skilled at obtaining approval for new courses and programs, securing resources from businesses and corporations outside the usual educational establishment, moving the educational setting outside the university and

even the geographic service area of the university, and bringing the resources of the community into the university. The teachers had established themselves as experts through various kinds of professional recognition and used this expert status to secure more of the needed resources for teaching.

A constellation of features which Sternberg and Horvath label as efficiency was verified among many of the teacher experts that were the focus of this study. The productivity of these award winners was impressive. They reinvested time saved through automatization to engage in new and innovative activities. They were characterized by their continual quest to improve what they were doing and to grow in new directions.

There was only limited evidence that insight was a feature of expertise among some teachers' narratives studied. From the data collected, we found that the content knowledge component appeared in every narrative while insight was in only three. At first glance such data might suggest that these teachers were knowledgeable but not insightful. A more likely explanation, is that the teaching behaviors that Sternberg and Horvath describe as insight would be detected by classroom observations and interviews aimed at the reasoning behind classroom explanations and selection of instructional strategies. Such behaviors are not likely to be revealed by a narrative without a targeted focus.

Through our discussions of the various components reflected in the narratives, the authors saw an interrelationship among pedagogical knowledge, practical knowledge, and the reinvestment of cognitive resources. The expert teachers reinvested their saved energies in the development of leading edge instructional strategies and learning environments that would be most beneficial for their students. Their practical knowledge enabled them to implement their innovative ideas. Furthermore, these teachers reported that their efforts not only benefitted the students but informed their own practice.

In summary, the data collected from this set of narratives presents a general picture which is consistent with many of the features of teaching expertise identified by Sternberg and Horvath and supports a prototype conceptualization of teaching expertise. While their prototype view is helpful in exploring teaching expertise, it must be kept in proper perspective. This view or model of expertise addresses the cognitive dimensions of performance but neglects other critical dimensions which affect the teaching act. Our study found evidence in the narratives that attitudinal qualities were often expressed by the expert teachers and influenced their instructional decision-making. Some of the teachers voiced their commitment to teaching and teacher education and wrote about their attitudes toward students. Some mentioned particular affective goals they believed to be highly important for their students to achieve. Such reflections illuminate gaps in this conceptualization of teaching expertise. Considerations for philosophical orientations, sociological conditions, and affective dispositions are examples of components of teaching that need inclusion in a comprehensive model of teaching expertise.

Although this study gives some indication of the nature of teaching expertise in higher education, a limitation of the study is that the award-winning teachers were all faculty in a college of education. Pedagogical knowledge may be harder to come by for faculty in other colleges. They may rely more heavily on advice from colleagues, trial and error, and feedback from students while college of education

faculty are more directly involved with professional journals and conferences focused on pedagogy. Comparisons of faculty from different academic disciplines would be an important extension of this research.

Certain limitations also apply to generalizations made regarding expert teaching by teacher educators. This study used reflective narratives submitted by award-winning faculty as the data source for data collection. These narratives were written to compete for a teaching award and addressed announced criteria for the award. Consequently, nominees focused on responding to these criteria. The narratives did not permit the researchers to make finer distinctions in certain categories. For example, in the area of pedagogical knowledge, it was not possible from the narratives to differentiate between content-specific and content-nonspecific knowledge. Narratives also provided very little understanding of the insight aspect of teaching expertise which Sternberg and Horvath identify in their model.

We believe other data sources must be examined in order to develop an adequate profile of an expert teacher educator. Sources such as observations of teaching, interviews of teachers, their associates, and students, instructional materials utilized, and publications would facilitate data collection about those areas the narratives failed to adequately cover. From a more extensive data base, perhaps it would be possible to verify features such as content-specific pedagogical knowledge and selective encoding. In addition, other features or categories of features of expertise could be discovered.

This preliminary study of expert teaching has led us to believe there are a number of studies that would be fruitful to conduct. We recommend that further studies be conducted which include a larger number of experts than represented in this study. We also recommend studies which compare narratives of award winners with those of nonaward winners and which compare experts in teacher education with experts in other subject fields. In these extended studies, it is recommended that multiple data sources be utilized. Future studies also need to explore relationships among various features of the prototype and discern the degree of relative importance of each feature. Once researchers have established a valid prototype of expert teaching at the postsecondary level then research needs to be conducted which connects features of expertise to student achievement. Understandings derived from such studies would greatly advance efforts to improve education for college students.

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